

REMARKS/ARGUMENTS

Drawings

In the enclosed amended Fig. 3, reference numeral 32 has been corrected to point to the non-bearing face of the turbine shroud rather than the knife edge as previously indicated. Accordingly, reconsideration of the rejection to the drawings is respectfully anticipated.

Oath/Declaration

The Oath or Declaration was indicated as being defective for failing to correctly identify the application number and filing date. Accordingly, the corrected Combined Declaration for Utility or Design Patent Application and Power of Attorney submitted herewith identifies the present application by the application serial number and filing date, as well as the Examiner's name and Group Art Unit. Reconsideration of the objection raised to the Oath or Declaration is therefore respectfully anticipated.

Examiner's Suggestions to Claim Language

With respect to the Examiner's comments regarding claim language of claims 6 and 7, the following amendments have been made. Claim 6 has been made dependent on claim 5 rather than claim 4, and therefore reference to "the knife edges" beginning at line 3 thereof is believed to be properly introduced in claim 5. Accordingly, it is believed that the second occurrence of "the" need not be deleted. In claim 7, the term "at least one" has been inserted after "said" in line 16 as suggested by the Examiner..

Claim Objections

Claim 14 was objected to for the use of the term "faces" at line 2 thereof. Accordingly, "faces" has been replaced by "face" as suggested by the Examiner.

Claim rejections under 35 U.S.C. § 112

Claim 5 was rejected under 35 U.S.C. 112, second paragraph, as being indefinite as the phrase "the knife edge extending across" was allegedly unclear. Accordingly, this phrase has been amended to read "each of the knife edges" in line 3 of claim 5. Reconsideration of the rejection of claim 5 under 35 U.S.C. 112 is therefore respectfully anticipated.

Claim rejections under 35 U.S.C. § 102

Claims 1-5 and 7-16 were rejected under 35 U.S.C. 102(b) as being anticipated by Beanland. Beanland discloses a turbine blade having a shroud portion 11 at its tip which extends circumferentially and cooperates with the shroud portion of the next adjacent blade to form a shroud ring. Each shroud portion has abutment surfaces 15 for abutment with the next adjacent shroud portions, however the abutment surfaces 15 form part of a separate bridge piece 16 which is fitted over the top of the shroud portion 11 and fixed in place thereon. The abutment surfaces are therefore provided by the end faces of end portions 18 of this separate bridge piece 16. Beanland discloses that the use of such a bridge piece of hard material simply and effectively solves the problem of frictional wear of the shroud abutment surfaces during vibration of the blades while keeping the cross-sectional area of the shroud portion to a minimum to reduce weight and cost of production. However, the use of this additional bridge portion in fact increases production cost as it requires additional manufacturing of a separate component, the tolerances of which must be carefully controlled to ensure a tight fit over the shroud portion 11 as well as leading to additional complications resulting from the need to affix the separate bridge piece 16 to the main shroud portion 11. Further, the main body of the shroud portion 11 taught by Beanland is not planar having ridges across its width and therefore provides a varying nominal thickness. As such, it is respectfully believed that Beanland fails to teach the subject matter of at least independent claims 1 and 7 of the present application. Reconsideration of their rejection as being anticipated by Beanland is therefore respectfully anticipated. At least in view of their dependence on independent claims 1 and 7, dependent claims 2-5 and 8-16 are also therefore believed to be novel over Beanland and reconsideration of their rejection is similarly requested.

Claims 1-6 and 7-16 were rejected under 35 U.S.C. 102(b) as being anticipated by Erdmann. Erdmann discloses a method and apparatus for forming a hardened contact surface on a shroud of a turbo machinery blade having additional contact face inserts 38 and 40 which include the wear or bearing surfaces 18 and 20 thereon and which are independently formed and fastened or affixed in place to the cast shroud of the blade assembly. Accordingly, Erdmann fails to teach or suggest the subject matter of claims 1 and 7 of the present application, and therefore reconsideration of their rejection as being anticipated by Erdmann is respectfully requested. At least in view of their dependence on independent claims 1 and 7, dependent claims 2-6 and 8-16 are similarly believed to be novel in view of Erdmann and reconsideration of their rejection is therefore also anticipated.

Claims 1-6 and 7-16 were further rejected under 35 U.S.C. 102(b) as being anticipated by Frost. Frost discloses a method of applying a wear resistant hard face material to a wear surface of the shroud of a turbine blade. Each shroud has a hard face material alloy 28 bonded thereto to help withstand the wear stresses and rubbing which occur between adjacent turbine blades as the blades twist during start-up and shut-down of the engine. Thus, Frost is particularly directed to increasing the hardness of the blade shrouds at the interlock surface between adjacent blades. This is achieved by applying the hard face material 28, which is made up of a thin foil 40 placed over a mating face 42 of the shroud 20 and the hard face material 28 laid overtop thereof to sandwich the foil between the mating face 42 and the hard face preform material. However, the face thickness of the hard face contact material is the same as that of the rest of the shroud 20. Accordingly, Frost clearly fails to teach the subject matter of the present invention as claimed. Reconsideration of the rejection of independent claims 1 and 7 is therefore respectfully anticipated. At least in view of their dependence on independent claims 1 and 7, dependent claims 2-6 and 8-16 are similarly believed to be novel in view of Frost and reconsideration of their rejection is therefore also anticipated.

Claim rejections 35 U.S.C. § 103

Claim 17 was rejected under 35 U.S.C. 103(a) as being obvious in view of either Erdmann or Frost. The Applicant believes with respect that this is false. First, as noted above, Frost fails to teach any local increase in thickness adjacent the contact faces of the shroud relative to a nominal thickness thereof. Regardless, it would not have been obvious to a turbine designer having ordinary skill in the art to design the shroud of either Erdmann or Frost such that local increases in area correspond to a desired face contact stress as this determination involves much consideration, such as predicting shroud curling direction and magnitude as well as relative shroud displacement during engine operation. Only once this determination is made can a designer achieve such a relatively light shroud design in which a nominal thickness is minimized while providing only a local increase in the shroud nominal thickness to increase the area of a contact face and to define the proper value of this increase. This clearly fails to comprise something that would have been obvious to one having ordinary skill in the art, particularly in view of the prior art addressing the problem of contact face shroud wear which has failed to achieve the necessary performance results and has necessitated a significantly more complex shroud geometry than that of the present invention.

Further, nothing taught or suggested by either Erdmann or Frost suggests a need to determine a desired face contact stress for at least one shroud contact

face such that a local increase in shroud area may be provided which corresponds to such a determined desired face contact stress. Merely because turbine designers take into account stresses when designing turbine components does not render the subject matter of claim 17 obvious, as nothing taught or suggested by Erdmann or Frost would lead to the method of reducing a turbine shroud face contact stress of the present invention as claimed, and no particular desirability for this is suggested. Accordingly, reconsideration of the rejection of claim 17 under 35 U.S.C. 103(a) is respectfully requested.

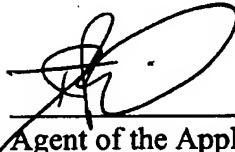
The prior art made of record but not cited by the Examiner, namely Borufka is noted by the Applicant.

Applicant respectfully requests that a timely Notice of Allowance be issued in this case.

Respectfully,

March 3, 2005

Date



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Amendments to the Drawings:

The attached drawing sheet 3/7 includes amendments to Fig. 3 and replaces drawing sheet 3/7 previously on file. The lead line for reference numeral 32 has been amended to correctly point to the non-bearing face of the turbine shroud.

Attachment: Replacement Sheet
 Annotated Sheet Showing Changes



3/7

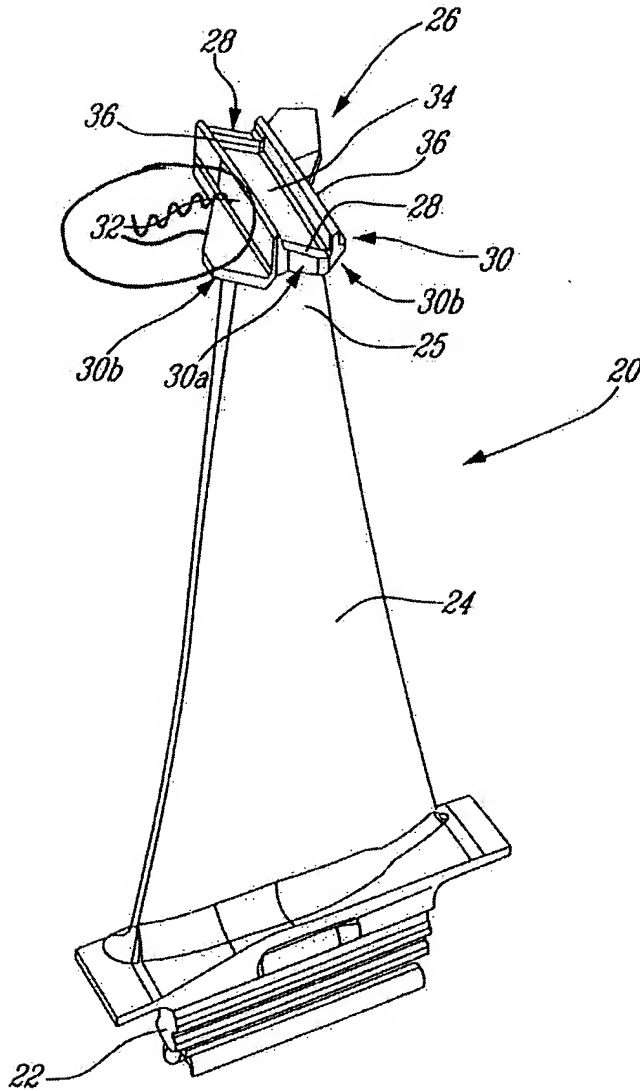


Fig. 3